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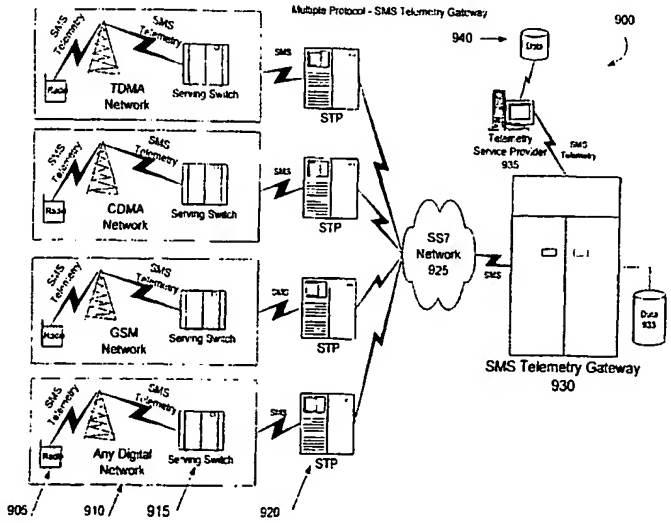
(54) Title: METHOD AND SYSTEM FOR IMPROVED SHORT MESSAGE SERVICES



(57) Abstract: A service provider uses a telemetry gateway to communicate with radio communication devices using various incompatible short message service (SMS) protocols. A communication, from the service provider to a radio communication device, passes through the telemetry gateway. The telemetry gateway determines the communication protocol of the radio communication device and converts the communication from a common protocol to the radio communication device's protocol. The telemetry gateway also determines and sends the converted communication over the appropriate communication path for receipt by the radio communication device. The telemetry gateway is also operable for providing registration information and receiving a communication from a radio communication device. The telemetry gateway can convert the received communication to a common protocol and transmit the converted communication to the service provider.

WO 2006/014419 A1

METHOD AND SYSTEM FOR IMPROVED SHORT MESSAGE SERVICES

RELATED PATENT APPLICATION

This patent application claims priority to and is a continuation-in-part of the patent application entitled "Interconnect System and Method for Multiple Protocol Short Message Services" filed on October 27, 2000 and assigned U.S. Application Serial Number 09/699,312. Applicants hereby incorporate by reference the full disclosure of U.S. Application Serial Number 09/699,312.

FIELD OF THE INVENTION

The present invention relates to the exchange of short messages between a telemetry gateway and a remote location, and more particularly to eliminating the delays associated with communicating short messages using of a short message switching center.

BACKGROUND OF THE INVENTION

Short Message Service (SMS) is an inherent capability of most digital wireless telecommunications systems. The radio technologies associated with each of the digital wireless telecommunications systems are technically incompatible at the radio signal layer, but most are compatible at the intersystem SS7 transport layer. Currently, the differing RF technologies, e.g., time division multiple access (TDMA), code division multiple access (CDMA), and global system for mobile telecommunications (GSM), have at least partial technical compatibility over the telephone industry's SS7 inter-networking system. The partial compatibility of these RF technologies is possible because the basic transport format is specified in the SS7 standard; however, many of the messaging details are implementation specific.

Even though it is possible for current short message service center platforms (SMSC) to support all of these multiple protocols, typically, an installed SMSC only supports the protocol of the cellular telecommunication system into which it is

installed. For example, if the SMSC is installed into an IS136 type TDMA system, the SMSC supports only the TDMA protocol. Similarly, if the SMSC is installed into a GSM system, then the SMSC supports only the GSM protocol. In other words, although most current SMSC's can interface with any of the currently popular digital cellular systems, the SMSC's do so on an individual basis, not all simultaneously.

For example, in one network, the nodes communicate using different data formatting standards, such as integrated services digital network (ISDN) and the Japanese X.50 standard. Each of the nodes is connected to a format converter. The format converter acts as a bi-directional converter for converting between two data formats and thus allows communication between the two nodes.

The format converter reformats the data formatted in the X.50 standard into the ISDN format. The format converter accomplishes the conversion by storing the incoming X.50 data in an aligned data RAM with offsets, to provide an appropriate alignment among the frames of the data. Then, a format conversion module reformats the data into the ISDN format one byte at a time.

In another network, a subscriber in an electronic messaging network can access messages in a variety of formats. A subscriber may receive messages through a variety of types of equipment, such as a voice mail system, an e-mail system, a facsimile machine and a telephone, all connected to a wireline network. The subscriber may access these messages through a pager, a cellular telephone, or a personal digital assistant, each connected to a different wireless network. The subscriber selects the wireline or wireless network and media format to be used for delivering messages or notifying a subscriber that a message has been received.

For example, the subscriber may elect to have notification of a voice mail or facsimile receipt directed to the personal digital assistant (PDA) in the form of an e-mail message. In accordance with the method of the network, the subscriber's selection is implemented through the personal intercommunications inter-networking system, which performs the appropriate data conversion from one protocol to another and delivers the e-mail message.

In yet another network, an intelligent signaling transfer point (ISTP) is included in a telephone network with a database for storing call processing control information. Calls from one station on the network to another are either passed through or intercepted at the ISTP and screened in accordance with criteria stored in the database, such as time of day, a certain originating area or caller, or a specified call count value.

In still another network, a data collection device is provided for use with *any one of* the following: TDMA; CDMA; frequency division multiple access (FDMA); GSM; and personal access communications systems (PACS) technologies. But, the data collection device does not use multiple such technologies in a single system. These systems and methods only teach conversion between two specific formats.

A further limitation with conventional SMS systems is that the SMS data transmissions are handled by the SMSC. The SMSCs use the address information contained within the data transmission to communicate with Home Location Registers ("HLRs") and route the data to the correct recipient. The SMS text messages can originate and terminate at cellular mobile radiotelephones or at other external messaging entities coupled to the cellular network such as email, voicemail, and web-based messaging systems.

SMS data transmissions are routed from the SMSC to the recipient via one or more switches. Once an SMS data packet arrives at the receiving device, the message is extracted from its packet and formatted for delivery. For example, if the receiving unit is a cellular mobile radiotelephone, the unit formats the message for display on the unit's display screen. Alternatively, if the receiving unit is an external messaging system, an SMSC can format the message for transmission within an email message for delivery to a user external to the cellular telephone system.

The SMSCs are deployed by cellular carriers and serve the customers within the carrier's private network. For example, Figures 5 and 6 illustrate conventional SMS systems 500 and 600 using SMSCs operated by a local and regional carrier, respectively. In each of the conventional systems illustrated in Figures 5 and 6, the

SMSCs 525 and 625 receive and store messages from radios 505 and 605. The SMSCs determine the destinations for the messages through a set of queries. Once there is available bandwith, the SMSC can deliver the messages to the appropriate destination. SMSCs 525 and 625 can also receive messages from external systems, such as an email system, that are destined for radios 505 and 605. The SMSCs 525 and 625 query the HLRs 520 and 620 to determine the locations of the destination radios 505 and 605. Once there is available bandwith, the SMSCs 525 and 625 can deliver the messages to radios 505 and 605. Significantly, all messages transmitted within each of systems 500 and 600 must use the same communication protocol. Conventional SMSCs 525 and 625 generally are not equipped to convert messages having different communication protocols.

Figures 7 and 8 illustrate conventional systems 700 and 800 for communicating roaming messages between different networks. Figure 7 illustrates a home SMSC 730 coupled to HLR 735 that transmits messages to and receives messages from switch 715. Figure 8 illustrates system 800 where a local SMSC 825 and an SMS clearinghouse 830 are used to communicate with a home SMSC 835. In each of systems 700 and 800, the switch or the SMSCs send a set of queries to the destination network in order to transmit messages. Furthermore, although the roaming messages are transmitted between different networks, the format of the messages is the same.

The SMSC of the conventional networks illustrated in Figures 5, 6, 7, and 8 acts as a "store and forward" system for the SMS data transmissions. The SMSC determines the routing for the data transmission and places the data in a queue for delivery to a cellular mobile radiotelephone or other messaging device. One shortcoming of conventional SMS systems is the delay in delivering the data transmissions queued at the SMSC. Typical delays for delivering messages can last minutes or hours.

One of the causes for the delay is that SMS messages are often assigned a lower delivery priority as compared to data transmissions containing voice

communications. The low priority assigned to SMS messages stored in a queue at the SMSC causes a delay in their delivery. This delay is particularly noticeable when a carrier lacks sufficient bandwidth on its network. A further cause for delay are the inefficient steps an SMSC takes to route and deliver a data transmission. For example, the SMSC queries the HLR each time it is delivering a message to a mobile communication device. The HLR is a database of profiles for subscribers comprising account and service information.

Accordingly, there is a need in the art for a system that can efficiently route SMS messages from originators to recipients. Specifically, there is a need in the art to communicate more efficiently with serving switches and avoid the delays caused by an SMSC. A communication platform is needed that delivers messages promptly instead of storing them for later delivery when there is available bandwidth. The needed communication platform should also eliminate unnecessary steps as part of the communication process. There is a further need for a communication platform that can communicate with remote stations that use different digital cellular or personal communication formats.

SUMMARY OF THE INVENTION

The present invention solves the problems identified above by providing a system and method for communicating short messages of varying formats rapidly and efficiently. A telemetry gateway performs certain functions of the SMSC and HLR of conventional SMS systems to support communications from various networks over the SS7 network. The telemetry gateway can receive a message from a radio communication device via the SS7 network, convert the message from one of the several standard messaging protocols to a common protocol, and transmit the message to a message service provider. The telemetry gateway can also receive a message from a service provider, determine the destination radio communication device and the expected protocol for the message, convert the message to the expected protocol, and transmit the message to the radio.

In one aspect, the invention comprises a method for communicating a message from a radio communication device to a recipient. First, the telemetry gateway can receive a registration notification and send registration information to a mobile switching center. Next, the telemetry gateway can receive a separate message associated with the registration information from the mobile switching center and return an acknowledgment message. The SMS telemetry gateway can convert the received message from a protocol used at the originating network to a common protocol. Once the message is converted, the SMS telemetry gateway can send the message to the recipient indicated in the terminating address with the message.

In another aspect, the invention comprises a method for communicating a message from a radio communication device to a recipient. A switch receives the message from the radio communication device and retrieves a profile associated with the message. The switch can use the profile to send the message to a telemetry gateway where the message is converted to a common message protocol and forwarded to the recipient. Once the message has been delivered to the recipient, the switch can receive a delivery confirmation from the telemetry gateway and send an acknowledgment to the radio communication device.

In a further aspect, the invention comprises a method for communicating a message received from a service provider to a radio communication device. Upon receiving the message, a telemetry gateway can request routing information from a switch at the destination network. The telemetry gateway can convert the message to the protocol used at the destination network and send the converted message to the switch for delivery to the radio communication device.

In yet another aspect, the present invention comprises a method for communicating a message from a service provider to a radio communication device. A switch can receive a route request associated with the message and send routing information to a telemetry gateway. If the switch does not recognize the radio communication device, the switch can request qualification information from the telemetry gateway before sending the routing information. After sending the routing

information, the switch can receive the message from the telemetry gateway in the appropriate format for forwarding to the radio communication device.

In a further aspect, the present invention comprises a system for supporting SMS communication between a service provider and a radio communication device. The system comprises a service provider that provides data messaging to a subscriber in one of a variety of formats, such as email, voicemail, or paging. The service provider can communicate with a plurality of mobile switching centers in different digital networks via a telemetry gateway. The telemetry gateway can identify the format of a message and convert the message to another format that is expected by the recipient. The telemetry gateway can also route the message to the intended recipient quickly with minimal communication steps.

These and other aspects of the invention will be described below in connection with the drawing set and the appended specification and claim set.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of an interconnect system according to an exemplary embodiment of the present invention.

FIG. 2 is a block diagram of an exemplary short message arbitrator of the system illustrated in FIG. 1.

FIG. 3 is a flow diagram illustrating an exemplary communications method used by the CCL to transmit data to the remote locations.

FIG. 4 is a flow diagram illustrating an exemplary communications method used by the remote locations to transmit data to the CCL.

FIG. 5 is a block diagram illustrating a prior art system for communication using a local carrier SMSC.

FIG. 6 is a block diagram illustrating a prior art system for communicating using a regional carrier SMSC.

FIG. 7 is a block diagram illustrating a prior art system for communicating where a home carrier has a direct roaming agreement with a local carrier.

FIG. 8 is a block diagram illustrating a prior art system for communicating where a local carrier uses a clearing house SMSC for roaming data.

FIG. 9 is a block diagram illustrating a system for communicating using a telemetry gateway according to an exemplary embodiment of the present invention.

FIG. 10A is a flow diagram illustrating an exemplary communications method for a message originating at a mobile radio.

FIG. 10B is a ladder diagram illustrating the sequence of communications for a message originating at a mobile radio as described in Figure 10A according to an exemplary embodiment of the present invention.

FIG. 11A is a flow diagram illustrating an exemplary communications method for a message terminating at a mobile radio.

FIG. 11B is a ladder diagram illustrating the sequence of communications for a message terminating at a mobile radio as described in Figure 11A according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION

The present invention is directed to a system and method for communicating among digital cellular systems of multiple formats. A telemetry gateway allows external messaging systems to send short messages to and receive short messages from multiple remote locations using different digital cellular or PCS standards. The telemetry gateway can convert inbound short messages from the typical communication formats used in conventional wireless networks to a common telemetry protocol for forwarding to external messaging service providers. The telemetry gateway can convert outbound short messages from the common telemetry protocol to the format of the destination radio communication device. The telemetry gateway also performs certain functions of conventional SMSCs and HLRs to provide for faster and more efficient delivery of short messages.

The present invention can be implemented in a variety of different embodiments. The first exemplary embodiment described herein uses a short

message arbitrator ("SMA") to intercept, convert, and transmit messages of varying formats. The second exemplary embodiment described herein uses the telemetry gateway which is capable of both converting short messages of different formats as well as transmitting and receiving messages more quickly and efficiently than conventional SMS systems.

Exemplary SMA Embodiment

Figure 1 shows an exemplary system for providing a flexible bi-directional data transport between a CCL 100 and one or more remote locations using wireless technologies. The CCL 100 sends and receives data to and from remote locations 123, 124, 125 and 126. Data from the CCL 100 is transferred to the SMA 104 using a public voice/data transport 102 over data circuits 101 and 103.

The SMA 104 converts the CCL's data to the proper format for transport to MSC's 109, 110, 117 and 119. The SMA 104 utilizes two routes for delivering the CCL's data to MSC's 109, 110, 117, and 119. The SMA 104 routes the CCL's data to one of the MSC's 109, 110, 117, and 119 by: 1) using a data circuit 105 to an SS7/IS41 Network 106, then over a data circuit (107, 108, 115 or 116) to the MSC (109, 110, 117, or 119) that is intended to receive the transmitted data; or 2) using a data circuit 103 back to the public voice/data transport 102, then over a data circuit (111, 112, 118, or 120) to the MSC (109, 110, 117, or 119) that is intended to receive the transmitted data.

Depending on the wireless access method used at the remote location, the CCL's data is routed to the selected wireless market. For advanced mobile phone service (AMPS) wireless communications, the data is transported from the MSC 109 to an AMPS radio 113 and finally to the remote location 123. For time division multiple access (TDMA) wireless communications, the data is transported from the MSC 117 to a TDMA radio 121 and finally to the remote location 125. For code division multiple access (CDMA) wireless communications, the data is transported from the MSC 119 to a CDMA radio 122 and finally to the remote location 126. For

global system for mobile telecommunications (GSM), the data is transported from the MSC 110 to a GSM radio 114 and finally to the remote location 124.

The system of Figure 1 provides for the bi-directional transport of data between a CCL 100 and its remote locations (123, 124, 125, or 126) using a wireless link (Cellular or PCS). The CCL 100 can use one or more methods to deliver data to the SMA 104. The various methods employ a variety of communication system is components. Below are four examples:

1) a dial-up data connection via a voice circuit 101 to the public voice/data transport 102 (public switched telephone network), then over the voice circuit 103;

2) a dial-up or dedicated data circuit 101 to the public voice/data transport 102 (Internet) then over the data circuit 103;

3) a dedicated data circuit 101 to public voice/data transport 102 (frame-relay private network) then over the data circuit 103; and

4) an ISDN circuit 101 to public voice/data transport 102 (public switched telephone network), then over the ISDN circuit 103.

After the SMA 104 receives the data from the CCL 100, it uses an identifying characteristic, such as the mobile identification number (MIN) or international mobile station identifier (IMSI), that was received with the data, to retrieve the CCL's profile 130 from a SMA database 128. The SMA determines the following from the CCL profile: 1) the MSC (109, 110, 117, or 119) serving the remote radio (113, 114, 121 or 122); 2) the wireless access method used in the MSC's market; 3) the CCL's class of service; and 4) the type of transport to use between the SMA 104 and the selected MSC (109, 110, 117, or 119). Based upon the information retrieved from the database, the SMA determines whether any alterations are required to the data or identifying characteristic to make the data compatible with a technologically dissimilar receiving unit or system.

The CCL's class of service may include one of the following: "CELLEMETRY" data service; short message system (SMS); asynchronous digital

data; or data over circuit switched voice cellular. "CELLEMETRY" data service is available to AMPS (analog and digital) radios, SMS and asynchronous digital data are available to digital radios (CDMA, GSM and TDMA), and circuit switched voice cellular is available in all methods of wireless access. In addition, those skilled in the art will appreciate that other classes of service may be used with the CCL 100 of the present invention.

For simplicity only one CCL 100 is illustrated in FIG. 1. However, the SMA can support multiple CCL's. Each CCL served by the SMA has a CCL identifier that is stored in the database.

Figure 2 shows an exemplary SMA 104 of the present invention. The controller 201 manages communication over the data circuits 103 and 105. The SMA database 128 (Figure 1) stores a profile for each CCL 100 supported by the SMA 104. The profile provides information to support the conversion and transport of data between a central location, such as CCL 100, and its remote locations, such as remote locations 123, 124, 125, and 126. From the stored profiles the SMA determines the recipient of the communication, as well as the method of data transport and any data conversions that are necessary.

The SMA analyzes the information about the CCL and the remote device stored in the database to determine whether the CCL and the remote are using compatible or incompatible data formats. If the CCL and the remote are using incompatible data formats, then the SMA converts the data. As will be apparent to one skilled in the art, the conversion from one data format into another can be managed in any suitable way, e.g., through multiple bi-directional translators 205.

Exemplary Communication Methods with the SMA

Figures 3 and 4 are flow diagrams illustrating exemplary communication methods of the present invention. These figures illustrate the communication methods utilized to transfer data between the customer central location (CCL) 100 and the remote locations (123, 124, 125, and 126) of FIG. 1. The communication methods of figures 3 and 4 allow the remote locations (123, 124, 125, and 126) and

CCL 100 to communicate, even though they are connected by multiple wireless (e.g. digital cellular and PCS) systems using multiple, otherwise incompatible protocols or data formats. In discussing the following flow diagrams, reference will be made to the elements of Figure 1.

Figure 3 is a flow diagram illustrating the communications method 300 used by the CCL 100 to transfer data to a remote location (123, 124, 125, or 126). Communications method 300 begins at step 302 and proceeds to step 304. At step 304, the CCL 100 transports the data to SMA 104. The SMA 104 at step 306 receives the data and retrieves the MIN, or other identifying characteristic, transported with the data. At step 308, the SMA 104 uses the MIN to retrieve the CCL's profile 130 from the SMA database 128.

From the profile 130, the SMA 104 determines the MSC (109, 110, 117, or 119) that is serving the remote radio (113, 114, 121 or 122) identified by the MIN, the wireless access method or data format used in the MSC's market, the class of service or data format used by the CCL, and the method of transport to use between the SMA 104 and the selected MSC (109, 110, 117, or 119), in step 310. In step 311, the SMA determines whether the data formats used by the CCL and the remote are compatible. If the data formats are compatible, then the Yes branch is followed to step 313. However, if the data formats are not compatible, then the No branch is followed to step 312. At step 312, the SMA 104 converts the data to the proper format.

At step 313, the SMA transports the data to the appropriate MSC (109, 110, 117, or 119) using the method of transport specified in the database. Proceeding to step 314, the MSC (109, 110, 117, or 119) receives and transports the data to the radio (113, 114, 121, or 122) associated with the remote location (123, 124, 125, or 126). Communications method 300 then proceeds to step 316. At step 316, the radio (113, 114, 121, or 122) receives the converted data and transports it to the remote location (123, 124, 125, or 126). Finally, communications method 300 proceeds to step 318 and the method ends.

Figure 4 is a flow diagram illustrating an exemplary remote communications method 400 used by the remote locations (123, 124, 125, or 126) to transfer data to the CCL 100. The remote communications method 400 illustrates the steps used by a remote location (123, 124, 125, or 126) to transport data to the CCL 100. Remote communications method 400 begins at step 402 and proceeds to step 404. At step 404, the remote location (123, 124, 125, or 126) commands its radio (113, 114, 121, or 122) to send data to its associated MSC (109, 110, 117, or 119). At step 406, the MSC (109, 110, 117, or 119) receives the data and transports it to the SMA 104.

The remote communications method 400 then proceeds to step 408. At step 408, the SMA 104 receives the data and retrieves the identifying characteristics, such as the MIN (or IMSI) and MSC identifier (MSCID), from the data. The SMA 104 searches the SMA database 128 using the MIN and MSCID that the MSC (109, 110, 117 or 119) transported with the data. Next, at step 410, the SMA 104 determines from the SMA database 128: 1) the CCL identifier; 2) the class of service used by the identified CCL 100; and 3) the wireless access method used by the MSC.

The SMA compares the class of service used by the CCL and the wireless access method used by the MSC to determine whether the data formats are compatible in step 411. If the data formats are compatible, then the Yes branch is followed to step 413. However, if the data formats are incompatible, then the No branch is followed to step 412 and the data is converted. Once the data is converted, the method proceeds to step 413. In step 413, the SMA delivers the data to the CCL. The SMA delivers the data to the CCL using a transmission path that is appropriate for the CCL identified by the CCL identifier. Then, remote communications method 400 proceeds to step 414 and ends.

Exemplary Communications with the SMA

The following examples are exemplary communications supported by the present invention. These examples are intended to illustrate some of the possible communication schemes, between the CCL 100 and the remote locations (123, 124, 125, and 126), that may be implemented with the present invention. These examples

are in no way intended to limit the scope of the invention. Those skilled in the art will appreciate that there are many other possible schemes and protocols that may be implemented with the present invention.

In a first example, the CCL 100 sends data to the remote location 123. The remote location 123 is associated with an AMP's radio 113 and the AMP's radio is served by MSC 109. The CCL's class of service is "CELLEMETRY" Data Service. The CCL 100 sends the MIN of the AMPS radio 113 along with the data to be transported to the SMA 104. The SMA 104 determines from the SMA database 128 that the MIN corresponds to the AMP's radio 113; the class of service is "CELLEMETRY" Data Service; and the MSC 109 serves the radio 113.

Depending on the type of mobile switching center, either an IS41 inter-system page message is sent from the SMA 104 to the MSC 109 through data circuit 105, the SS7/IS41 network 106 and the data circuit 108; or a roamer-access call is made from the SMA 104 to the MSC 109 through circuit 103, public voice/data transport 102 and the data circuit 111. The SMA determines the appropriate method of transport between the SMA 104 and the MSC 109 from the database 128. The MSC 109 then broadcasts a page order, which is received by the AMPS radio 113 and delivered to the remote location 123 to complete the transaction.

In another example, the remote location 123 sends data to the CCL 100. The remote location 123 is associated with the AMP's radio 113 and the AMP's radio is served by MSC 109. The remote location 123 sends a message to the CCL 100 by commanding the AMPS radio 113 to generate a regeneration notification that is received by the MSC 109. The MSC 109 then forwards the regeneration notification to the SMA 104, via the data circuit 108, the SS7/IS41 network 106 and the data circuit 105. Once the SMA 104 receives the notification, the SMA 104 searches the SMA database 128, using the MIN and the MSCID provided by the MSC 109. From the database 128, the SMA 104 determines the following: 1) the CCL identifier for the intended recipient; 2) the class of service used by the CCL; and 3) and the wireless access method used by MSC 109. The SMA 104 compares the class of

service used by the CCL 100 and the wireless access method used by MSC 109 to determine whether the data needs to be converted. If so, the SMA 104 converts the data. The data is delivered to the CCL 100 using the data circuit 103, public voice/data transport 102 and the data circuit 101.

In a further example, the CCL 100 sends data to the remote location 125. The remote location 125 is associated with a TDMA radio 121 and the TDMA radio is served by MSC 117. The CCL 100 sends the MIN of the TDMA radio 121 along with the data to the SMA 104. The SMA 104 determines from the SMA database 128 that the MIN corresponds to the TDMA radio 121; short message system (SMS) is the class of service; the MSC 117 serves the radio 121, and the method of transport between the SMA and the MSC 117. In this example, the method of transport is via data circuit 105 and SS7/IS41 network 106. Once this information is retrieved, the SMA 104 sends an IS41 SMS message to the MSC 117 through data circuit 105, the SS7/IS41 network 106, and data circuit 116. Then, MSC 117 sends a SMS message to radio 121, which in turn delivers the data to remote location 125 to complete the transaction.

In a further example, the remote location 125 sends data to the CCL 100. The remote location 125 is associated with the TDMA radio 121 and the TDMA radio is served by MSC 117. The remote location 125 commands the TDMA radio 121 to originate an SMS message, which is received by the MSC 117 and transported to the SMA 104. The SMS message is transported to the SMA 104 through circuit 116, the SS7/IS41 network 106 and, the data circuit 105. The SMA 104 then searches the SMA database, using the MIN and the MSCID provided by the MSC 117, and determines: the CCL identifier; the class of service used by the CCL identified by the CCL identifier; and the wireless access method used by the MSC 117. The SMA 104 compares the class of service used by the CCL 100 and the wireless access method used by the MSC 117 to determine whether the data needs to be converted. If so, the SMA 104 converts the data. The data is then delivered to the CCL 100 using the data circuit 103, the public voice/data transport 102 and the data circuit 101.

In yet a further example, the CCL 100 wishes to send data to the remote location 126. The remote location 126 is associated with a CDMA radio 122 and the CDMA radio is served by MSC 119. The CCL 100 sends the MIN of the CDMA radio 122 along with the data to be transported to the SMA 104. The SMA 104 determines from the SMA database 128 that the MIN corresponds to the CDMA radio 122; asynchronous digital data is the class of service; that the MSC 119 serves the CDMA radio 122; and that the method of transport from the SMA 104 to the MSC 119 is via data circuit 103 and public voice/data transport 102. Once this information is retrieved, a data message is sent from the SMA 104 to MSC 119. The message is sent through data circuit 103, public voice/data transport 102, and the data circuit 120. The data message is then sent by the MSC 119 to the CDMA radio 122, which in turn sends the data message to the remote location 126 to complete the transaction.

In a final example, the remote location 126 wishes to send data to the CCL 100. The remote location 126 is associated with a CDMA radio 122 and the CDMA radio is served by MSC 119. The remote location 126 requests that CDMA radio 122 initiate an asynchronous digital data call, which is received by the MSC 119 and transported to the SMA 104. The MSC 119 transports the data call via the data circuit 120, the public voice/data transport 102, and data circuit 103. The SMA 104 then searches the SMA database 128, using the MIN and the MSCID provided by the MSC 119, and determines: the CCL identifier for the intended recipient; the class of service used by the intended recipient; and the wireless access method used by the MSC 119. The SMA 104 compares the class of service used by the CCL 100 and the wireless access method used by the MSC 119 to determine whether the data needs to be converted. If so, the SMA 104 converts the data. The data is then delivered to the CCL 100 using the data circuit 103, the public voice/data transport 102 and the data circuit 101.

While a preferred embodiment has been set forth above, those skilled in the art who have reviewed the present disclosure will readily appreciate that other embodiments can be realized within the scope of the present invention. For example,

transmission between the CCL 100 and the SMA 104 can take place through any suitable network, such as a TCP/IP Network. Also, any SMS protocol can be used.

Exemplary Telemetry Gateway Embodiment

In an alternate embodiment, the present invention can be implemented using a telemetry gateway. A telemetry gateway comprises hardware and software modules capable of communicating messages to MSCs in various digital networks. The telemetry gateway can perform certain functions of an HLR and SMSC found in conventional SMS systems, as illustrated in Figures 5-8. Replacing the HLR and the SMSC used in conventional SMS systems allows the telemetry gateway to provide faster and more efficient routing of messages. Specifically, instead of the "store and forward" functions performed by the SMSC that typically cause a lag of minutes or hours in the transmission of messages, the telemetry gateway does not store the messages it receives. The telemetry gateway typically processes and transmits messages in milliseconds. The telemetry gateway is more efficient than conventional SMS systems because it considers all messages as roaming and eliminates the need to query the HLR before sending a message to a mobile communication device. The telemetry gateway offers a further advantage over a conventional SMSC in that it also has the ability to convert messages having different messaging protocols.

Referring to Figure 9, an exemplary architecture 900 is illustrated for implementing an SMS telemetry gateway 930. In the exemplary architecture 900, the SMS telemetry gateway 930 can communicate with digital networks using a variety of different wireless access formats. While exemplary architecture 900 illustrates a TDMA network, a CDMA network, and a GSM network, those skilled in the art will understand that the invention is not limited to these examples of digital networks. Similarly, while the SMS telemetry gateway 930 is shown coupled to a telemetry service provider 935, the present invention is not limited to a single service provider. The SMS telemetry gateway can communicate with service providers supporting a variety of external messaging systems including email, voicemail, paging, and Web-based messaging.

Turning to the general digital network 910, a cellular mobile radiotelephone, or radio, 905 can transmit a message via the network 910 to the MSC, or serving switch, 915. The radio 905 may be a fixed or mobile radio communication device. The serving switch 915 determines that the message is a roaming communication and transmits the message to signal transfer point 920 for routing to the SMS telemetry gateway 930 via SS7 network 925. Although the SS7 network 925 is the method for transmission to the SMS telemetry gateway 930 in the preferred embodiment illustrated in Figure 9, other data networks can also perform the same function. Upon receipt of the message, the SMS telemetry gateway 930 converts the message to a common telemetry protocol and determines the destination service provider 935 from the message's address field. The SMS telemetry gateway 930 can also conform the converted message to any delivery preferences for the service provider 935 stored in database 933. For example, an alternate network address for the service provider 935 may be stored in database 933.

Once the delivery preferences are conformed, the SMS telemetry gateway 930 transmits the message in the common protocol to the appropriate service provider 935. In contrast to the SMSC of conventional SMS systems, the SMS telemetry gateway 930 does not store the message for later delivery. Instead, the SMS telemetry gateway 930 transmits the message to the service provider 935 as soon as the processing steps are completed. The SMS telemetry gateway typically processes and transmits messages in a few milliseconds as opposed to the minutes or hours of delay with conventional SMS systems.

When the service provider 935 receives the telemetry message, it can package the message for its subscribers in a variety of formats. For example, the service provider 935 can insert the message into an email for delivery to an email system. In another embodiment, the service provider 935 can use the message to create a voicemail which is forwarded to the subscriber. The service provider 935 can also transmit a confirmation that the message was received to the SMS telemetry gateway 930.

The SMS telemetry gateway 930 is a bidirectional system that can also transmit messages from the service provider 935 to radio 905. When the SMS telemetry gateway 930 receives a message from the service provider 935, it requests routing information from the switch 915 at the destination network 910. The SMS telemetry gateway 930 converts the message to the wireless access format used at the destination network 910 and transmits the message.

The SMS telemetry gateway's 930 direct access to the SS7 network 925, as illustrated in exemplary architecture 900, allows for faster and more efficient communication of short messages. Furthermore, its ability to convert messages from a variety of different wireless access formats enables communication with a greater number of networks.

Exemplary Communication Methods with the Telemetry Gateway

Figures 10A and 11A illustrate exemplary methods for communicating messages using the SMS telemetry gateway 930 in accordance with an exemplary embodiment of the present invention. Figure 10A illustrates an exemplary communication method for a message originating at a mobile radio, whereas Figure 11A is an example of a method for a mobile radio terminating message. Those skilled in the art will recognize that the methods illustrated in Figures 10A and 11A are only examples and that other messaging techniques can be implemented in other embodiments using the SMS telemetry gateway.

Referring to Figure 10A, exemplary method 1000 is illustrated for transmitting a message originating at a mobile radio. The sequence of steps performed in exemplary method 1000 are also shown in exemplary ladder diagram 1080 illustrated in Figure 10B. Referring to exemplary method 1000, the switch 915 receives a message, or "SM", from the radio 905 in step 1005. The switch queries its visitor location register ("VLR") in step 1010 to locate a profile for the radio 905. The VLR is a database comprising temporary information about subscribers of one network that are roaming into another network. The switch uses the information in the VLR to complete roaming communications.

If there is no entry in the VLR database in step 1015, the switch 915 sends a registration notification to the telemetry gateway 930 to obtain account and service information for the subscriber. The switch 915 receives the registration response with the needed information from the SMS telemetry gateway 930 in step 1025 and creates a profile in the VLR database in step 1030. The terms "registration notification" and "registration response" are used herein to refer to general steps for identifying the radio communications device. These terms do not limit the invention to particular types of networks or protocols.

Alternatively, if a VLR entry already exists in step 1015, the switch 915 can proceed directly to step 1035 and transmit the message to the signal transfer point 920 for routing to the SMS telemetry gateway 930 in step 1040. A characteristic of SMS communications includes guaranteed delivery of messages through the use of confirmation messages. For example, when the SMS telemetry gateway 930 receives the message, it returns a confirmation response to the switch 915 in step 1045. In step 1050, the SMS telemetry gateway converts the received message from the protocol used at the originating network 910 to the common telemetry protocol used by the service provider 935.

In steps 1055 and 1060 of exemplary method 1000, the SMS telemetry gateway uses the originating address field to determine the routing to the service provider 935 and to check for any delivery preferences stored in database 933. The converted message is ready for delivery to the service provider 935 in step 1065. Upon delivery, the service provider 935 typically transmits a delivery confirmation response to the SMS telemetry gateway. The SMS telemetry gateway 930 performs steps 1050 - 1065 in a matter of milliseconds, which is a significant improvement over the conventional "store and forward" techniques of the SMSC platforms used in SMS systems.

Turning to Figure 11A, an exemplary method 1100 is illustrated for transmitting a message that originates at a service provider and terminates at a mobile radio. Exemplary ladder diagram 1180 shown in Figure 11B also illustrates the

sequence of steps described in exemplary process 1100. Process 1100 begins with the service provider 935 transmitting a message, or SM, to the SMS telemetry gateway 930 in step 1105. The service provider 935 receives the message from a subscriber using one of the messaging systems that the service provider 935 supports such as an email or paging system. In steps 1110 and 1115, the SMS telemetry gateway 930 sends an acknowledgment to the service provider 935 and requests routing information for the message from the switch 915 in the destination network. If there is a VLR entry for the SMS telemetry gateway in step 1120, the switch will proceed with providing the routing information in step 1135.

However, if the switch 915 does not recognize the radio 905, the switch will need to create a VLR entry in its database. The switch 915 creates a VLR entry in steps 1125 and 1130 by sending a qualification request for account and service information to the SMS telemetry gateway 930. Once the switch 915 creates a VLR entry, it can provide the routing information for the SMS telemetry gateway 930 in step 1135.

The wireless access format that the destination network employs is typically stored in a database at the SMS telemetry gateway 930. The SMS telemetry gateway 930 uses the format information to convert the message, in step 1140, to the format expected at the destination network. In steps 1145 and 1150, the SMS telemetry gateway 930 transmits the converted message to the switch 915 and the switch 915 forwards the message to the radio 905. Consistent with the guaranteed delivery of the SMS system, the switch 915 returns an acknowledgment of delivery in step 1155 and the SMS telemetry gateway 930 forwards an acknowledgment to the service provider 935 in step 1160.

In conclusion, the present invention, as represented in the foregoing exemplary embodiments, provides a system and method for communicating short messages that is more flexible and efficient than conventional SMS systems. The exemplary SMS telemetry gateway can convert messages to different message formats in order to support communication with a variety of wireless networks. The

exemplary SMS telemetry gateway also performs the routing functions of components in conventional SMS systems, but does so more quickly and efficiently.

It will be appreciated that the present invention fulfills the needs of the prior art described herein and meets the above-stated objects. While there has been shown and described the preferred embodiment of the invention, it will be evident to those skilled in the art that various modifications and changes may be made thereto without departing from the spirit and the scope of the invention as set forth in the appended claims and equivalents thereof. For instance, the present invention could be implemented in data networks other than the SS7 network illustrated in exemplary architecture 900. The invention can also be adapted to support communication with messaging protocols other than the wireless access formats described herein.

CLAIMS

What is claimed is:

1. A method for communicating a message from a telemetry device to a recipient comprising the steps of:

receiving a registration notification corresponding to the message from a mobile switching center;

sending a response to the registration notification to the mobile switching center;

receiving the message from the mobile switching center;

sending an acknowledgement to the mobile switching center in response to receiving the message;

converting the message to a common protocol; and

transmitting the message to the recipient according to a terminating address.

2. The method of Claim 1, wherein the response to the registration notification comprises information about the telemetry device from which the message originated.

3. The method of Claim 1, wherein the received message has a protocol that is CDMA, TDMA, or GSM.

4. The method of Claim 1, further comprising the step of conforming the message according to a preference of the recipient.

5. The method of Claim 1, wherein the recipient is an email system, a voicemail system, or a web-based messaging system.

6. The method of Claim 1, wherein the telemetry device and the recipient subscribe to different communication carriers.

7. A method for communicating a message from a radio communication device to a recipient comprising the steps of:

receiving the message from the radio communication device;

retrieving a profile associated with the radio communication device from a storage medium;

sending the message using information in the profile to a telemetry gateway for conversion to a common protocol and transmission to the recipient;

receiving a delivery confirmation from the telemetry gateway; and

sending a message acknowledgement to the radio communication device.

8. The method of Claim 7, wherein the step of retrieving the profile further comprises,

if there is no profile in the storage medium,

requesting registration information associated with the radio communication device from the telemetry gateway; and

creating a profile entry with the registration information in the storage medium.

9. The method of Claim 7, wherein the received message has a protocol that is CDMA, TDMA, or GSM.

10. The method of Claim 7, wherein the transmission of the converted message to the recipient is performed in accordance with a delivery preference of the recipient.

11. The method of Claim 7, wherein the recipient is an email system, a voicemail system, or a web-based messaging system.

12. The method of Claim 7, wherein the recipient and the radio communication device are associated with different communication carriers.

13. A method for communicating a message from an originating communication device to a radio communication device comprising the steps of:

sending the message in a first format to a telemetry gateway, wherein the telemetry gateway is operable for,

transmitting a routing request to a mobile switching center based on the information in the message;

receiving a routing response for the message;

converting the message to a second format based on the routing response; and

transmitting the converted message to the mobile switching center for forwarding to the radio communication device.

14. The method of Claim 13, wherein the originating communication device and the radio communication device subscribe to different communication networks.

15. The method of Claim 13, wherein the originating communication device is an email system, a voicemail system, or a Web-based messaging system.

16. The method of Claim 13, wherein the second format is CDMA, TDMA, or GSM.

17. The method of Claim 13, wherein the step of transmitting a routing request to the mobile switching center further comprises,

if the mobile switching center does not recognize the radio communication device,

transmitting a qualification request from the mobile switching center to the telemetry gateway; and

transmitting a qualification response identifying the radio communication device to the mobile switching center.

18. A method for communicating a message from a service provider to a telemetry device comprising the steps of:

receiving the message from the service provider;

transmitting a route request associated with the message to a mobile switching center;

receiving a route response for the message from the mobile switching center;

converting the message from a first protocol to a second protocol based on the route response; and

transmitting the converted message to the mobile switching center for forwarding to the telemetry device.

19. The method of Claim 18, further comprising the steps of:

receiving a message delivery confirmation from the mobile switching center upon forwarding the converted message to the telemetry device; and

transmitting a message delivery notification to the service provider upon receipt of the message delivery confirmation.

20. The method of Claim 18, wherein the service provider and the telemetry device are associated with different communication networks.

21. The method of Claim 18, wherein the service provider is an email system, a voicemail system, or a Web-based messaging system.

22. The method of Claim 18, wherein the second protocol is CDMA, TDMA, or GSM.

23. The method of Claim 18, wherein the step of transmitting a route request to the mobile switching center further comprises,

if the mobile switching center does not have access to a profile for the telemetry device,

receiving a qualification request from the mobile switching center; and

transmitting a qualification response for creating a profile for the telemetry device to the mobile switching center.

24. A method for communicating a message from a service provider to a radio communication device comprising the steps of:

receiving a route request associated with the message from a telemetry gateway;

retrieving route information associated with the message and transmitting the route information to the telemetry gateway;

receiving the message from the telemetry gateway, wherein the telemetry gateway has converted the message to the radio communication device's protocol; and

transmitting the converted message to the radio communication device.

25. The method of Claim 24, further comprising the step of transmitting a confirmation to the telemetry gateway that the message has been delivered.

26. The method of Claim 24, wherein the service provider and the radio communication device subscribe to different carriers.

27. The method of Claim 24, wherein the service provider is an email system, a voicemail system, or a Web-based messaging system.

28. The method of Claim 24, wherein the radio communication device's protocol is CDMA, TDMA, or GSM.

29. The method of Claim 24, wherein the step of retrieving route information further comprises:

if the radio communication device is unknown,

transmitting a qualification request to the telemetry gateway;

receiving a qualification response from the telemetry gateway; and

creating a database entry for the radio communication device using the qualification response.

30. A system for communicating a message from a radio communication device to a service provider comprising:

a mobile switching center operable for receiving the message from the radio communication device; and

a telemetry gateway operable for

receiving the message from the mobile switching center,

converting the message from a first format chosen from at least three different wireless access formats to a common format, and

transmitting the converted message to the service provider.

31. The system of Claim 30, further comprising a signal transfer point operable for routing the message from the mobile switching center to the telemetry gateway.

32. The system of Claim 30, wherein the mobile switching center further comprises a visitor location register comprising a profile associated with the radio communication device.

33. The system of Claim 30, wherein the telemetry gateway further comprises a database comprising a data record associated with the service provider.

34. The system of Claim 30, wherein the service provider is operable for delivering the message as an email, a voicemail, or a page.

35. A system for communicating a message from a service provider to a radio communication device comprising:

a telemetry gateway coupled to the service provider, the telemetry gateway operable for

receiving the message from the service provider;

requesting routing information associated with the message;

converting the message from a common format to a specific format associated with the radio communication device, wherein the specific format is chosen from one of at least three different wireless data formats; and

a mobile switching center operable for receiving the converted message from the telemetry gateway and transmitting the converted message to the radio communication device.

36. The system of Claim 35, wherein the telemetry gateway further comprises a database comprising a data record associated with the service provider.

37. The system of Claim 35, wherein the mobile switching center further comprises a visitor location register comprising a profile associated with the radio communication device.

38. The system of Claim 35, wherein the service provider is operable for receiving the message as an email, a voicemail, or a page.

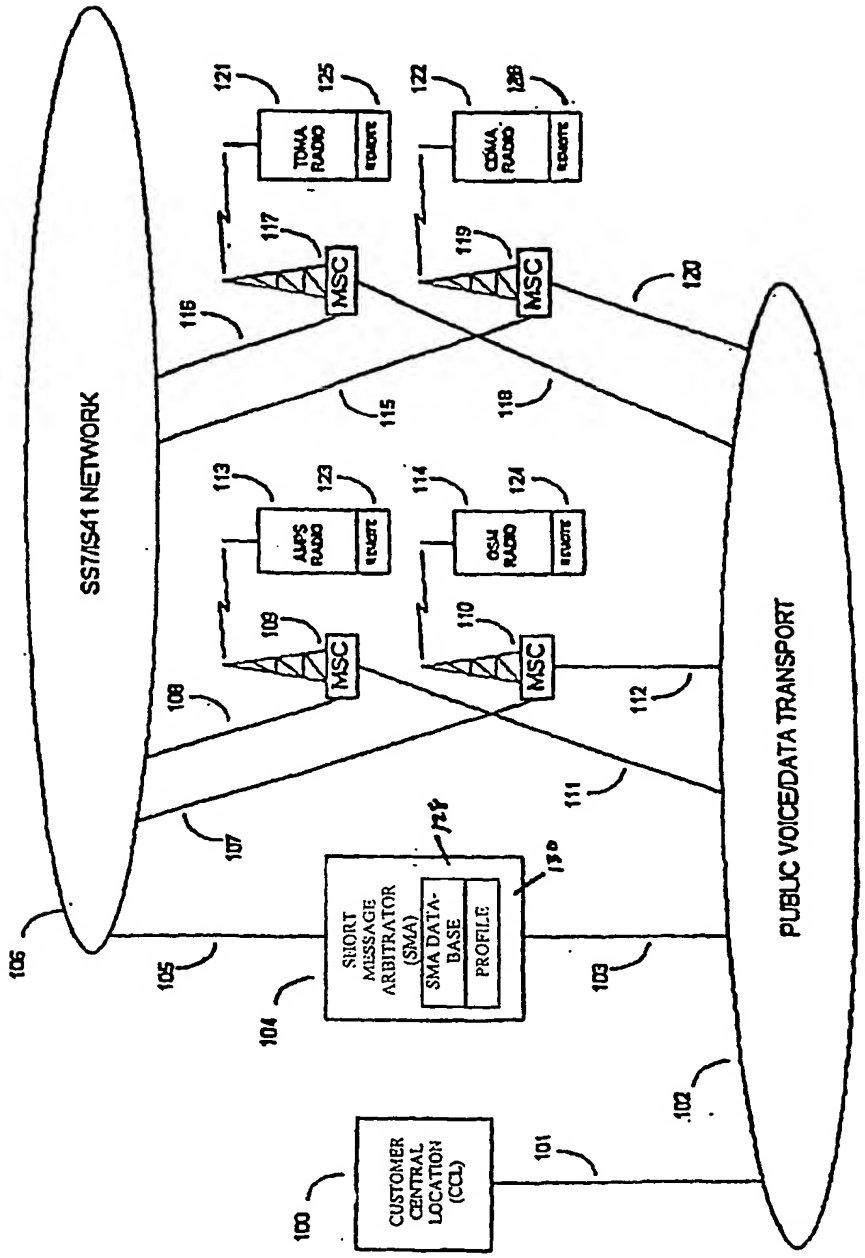

SS7/IS41 NETWORK
PUBLIC VOICE/DATA TRANSPORT
CUSTOMER CENTRAL LOCATION (CCL)
SHORT MESSAGE ARBITRATOR (SMA)
SMA DATA-BASE
PROFILE
MSC
MSC
MSC
MSC
TDMA RADIO
CDMA RADIO
AMPS RADIO
GSM RADIO
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
130

FIG. 1

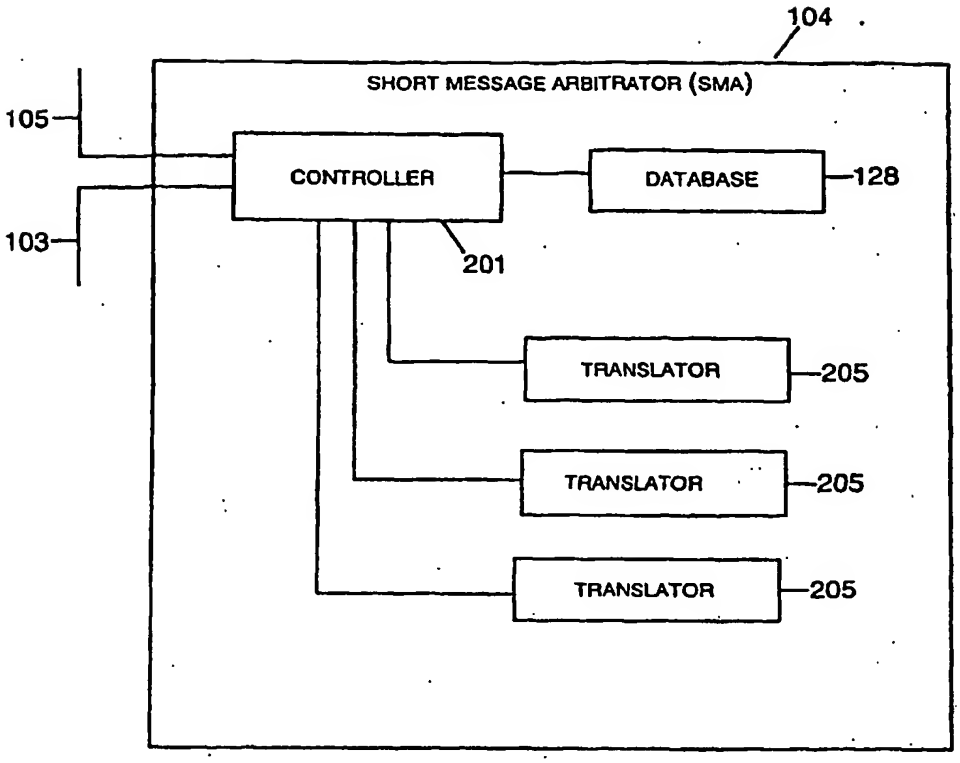

104
SHORT MESSAGE ARBITRATOR (SMA)
105
103
CONTROLLER
DATABASE
128
201
TRANSLATOR
205
TRANSLATOR
205
TRANSLATOR
205

FIG. 2

CCL COMMUNICATIONS METHOD

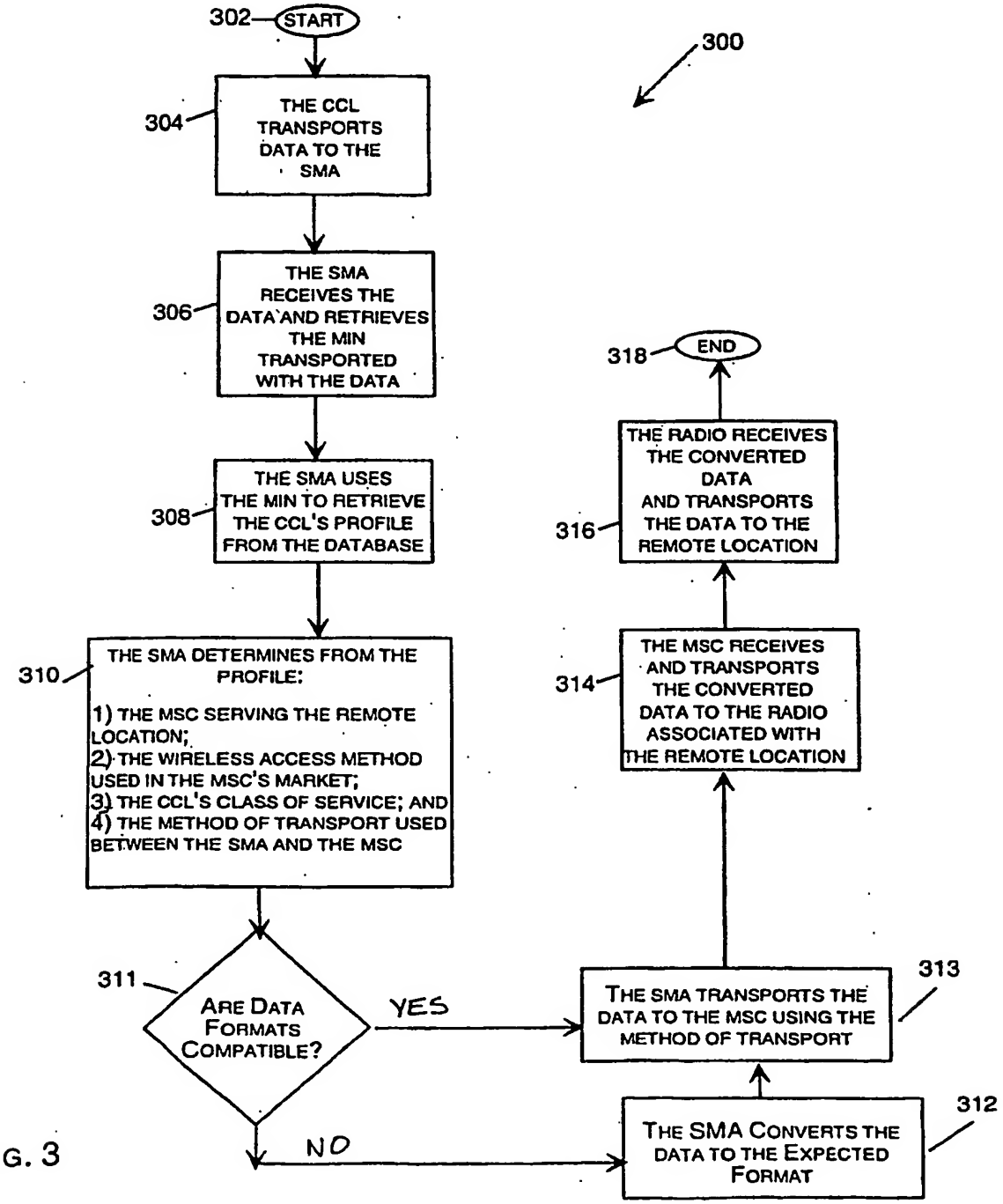


FIG. 3

REMOTE COMMUNICATIONS METHOD

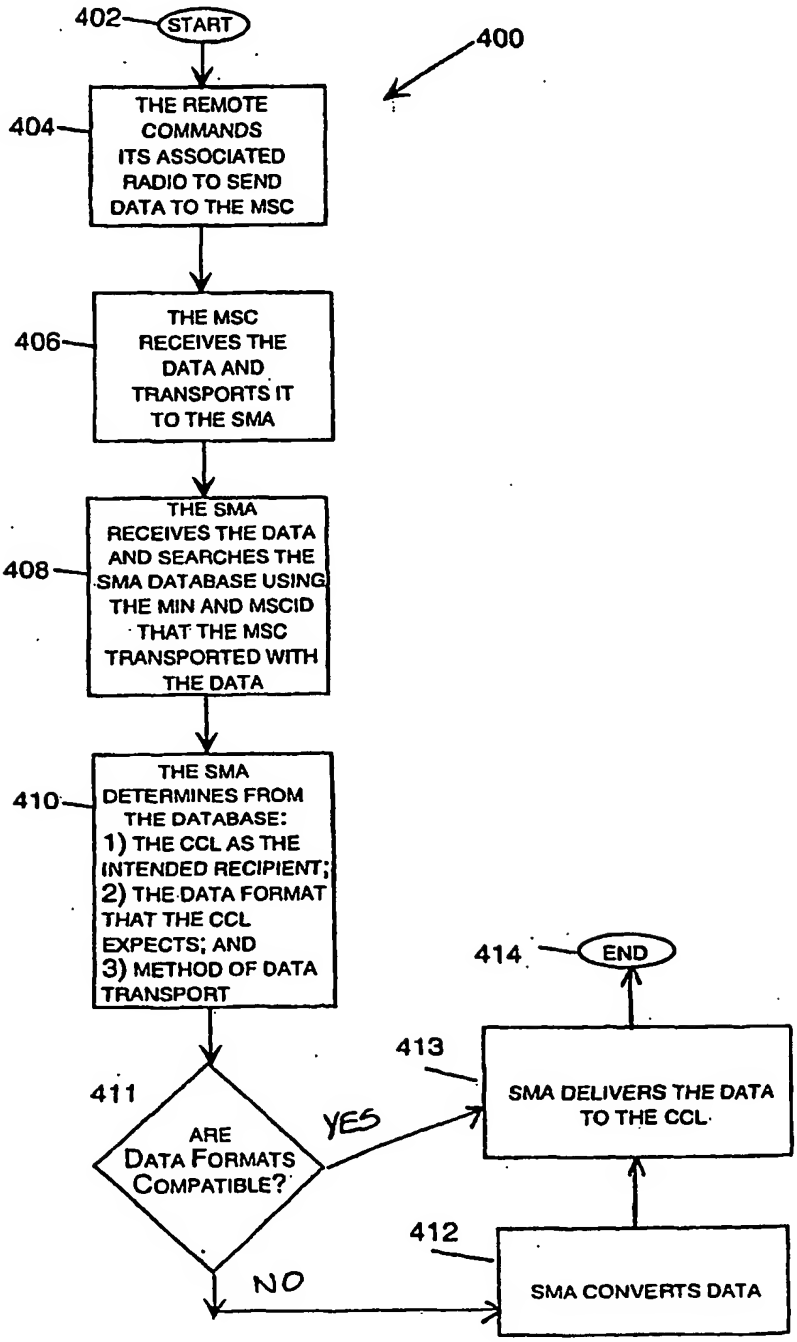


FIG. 4

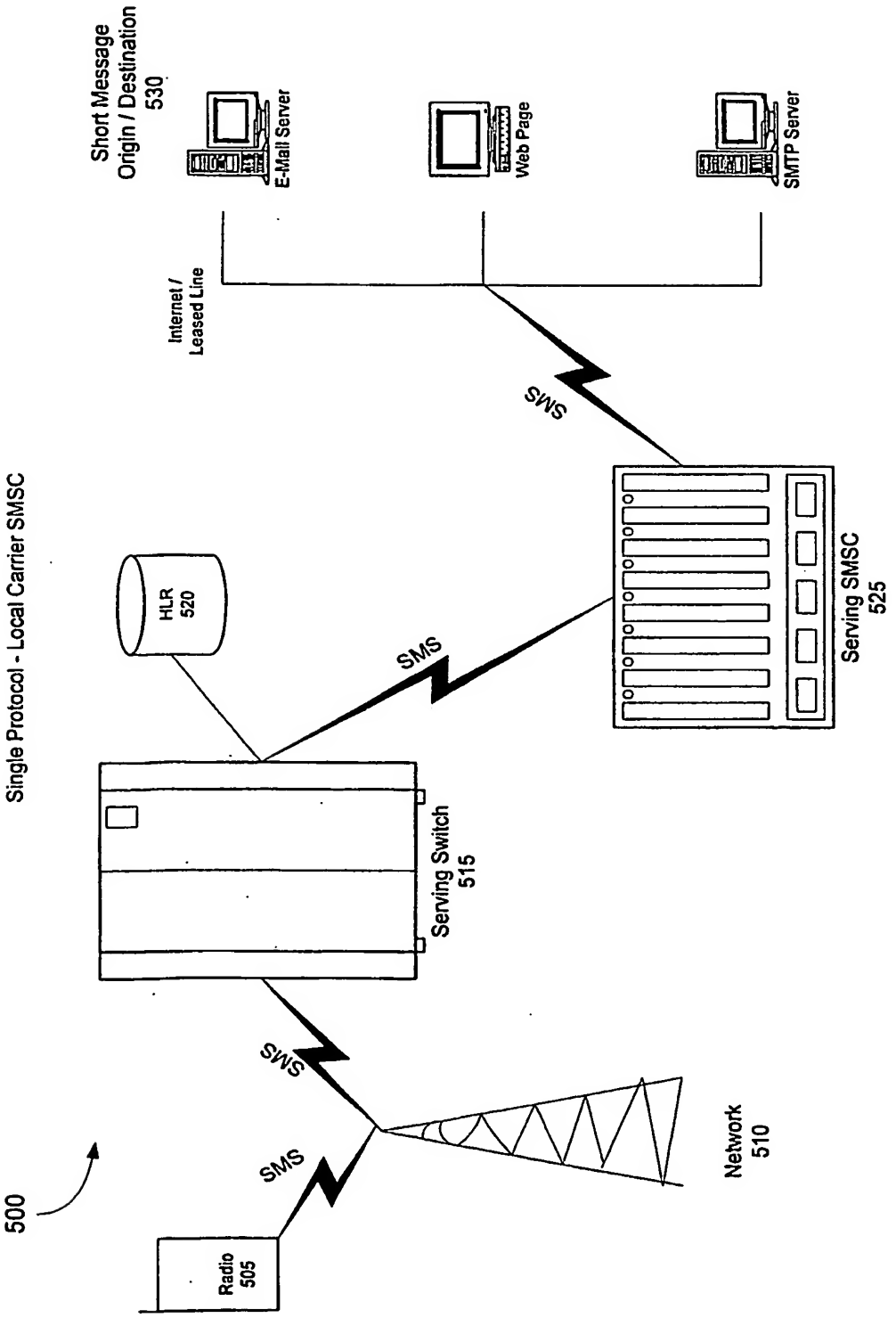


FIG. 5 - prior art

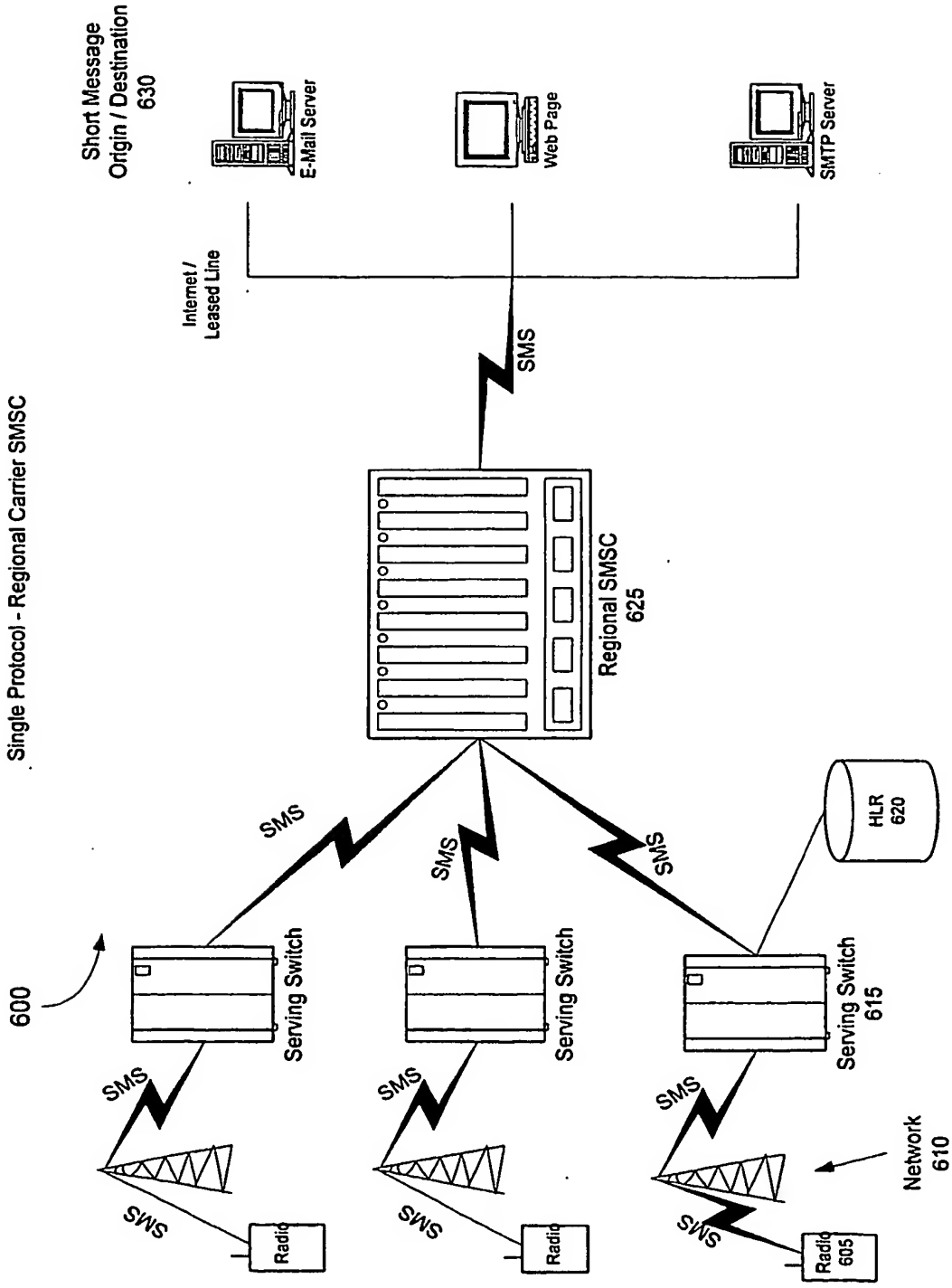


FIG. 6 - prior art

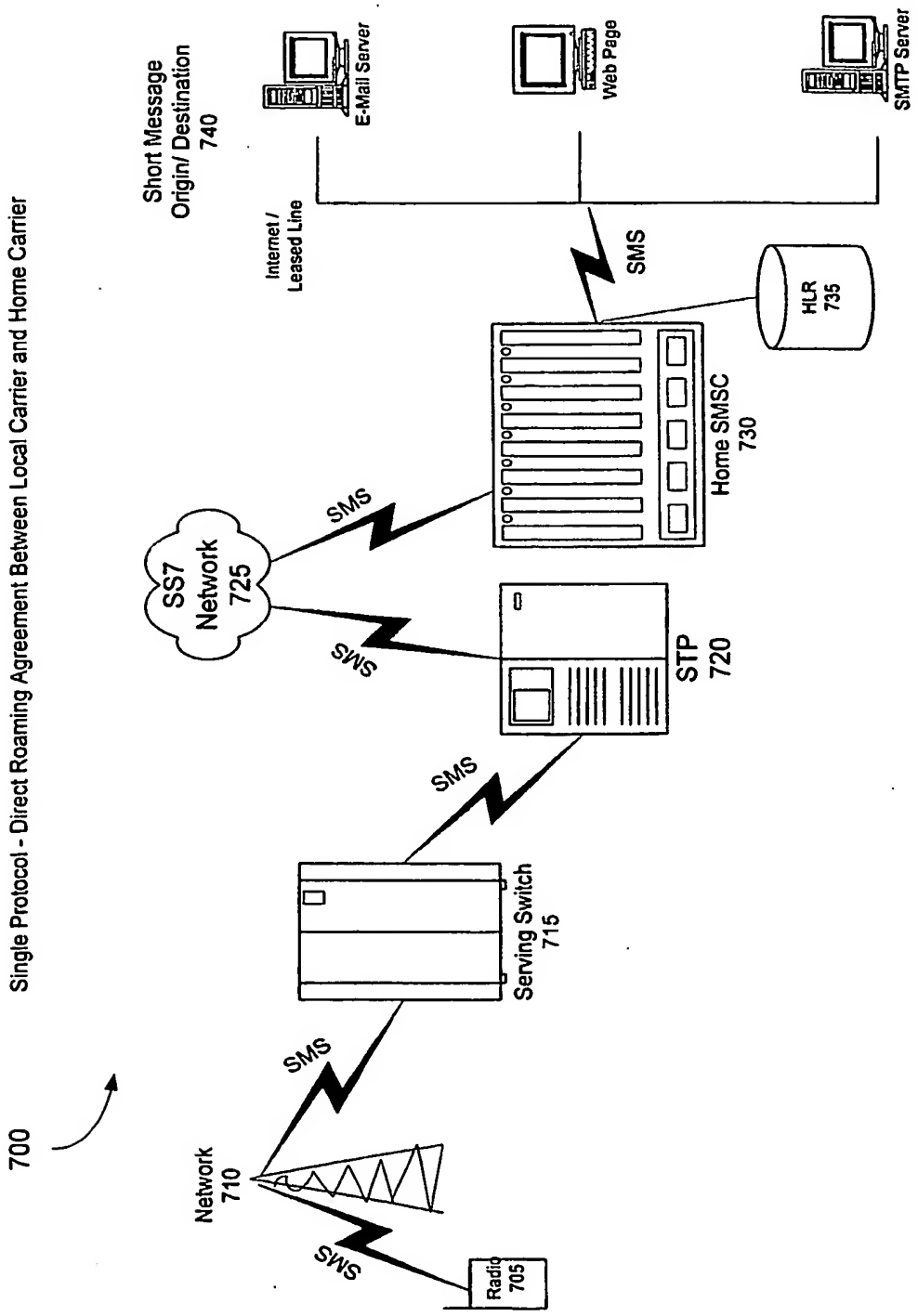


FIG. 7 - prior art

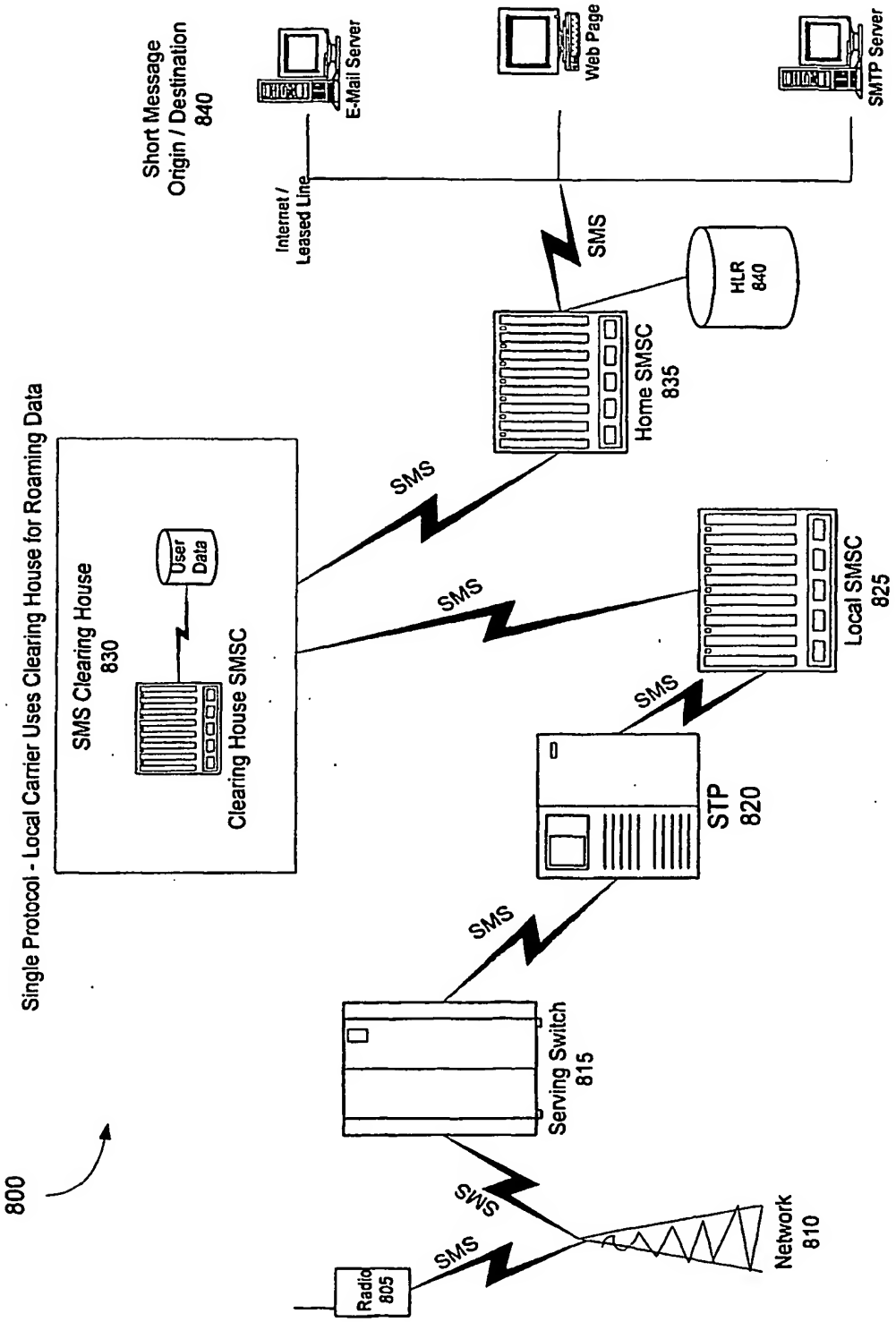


FIG. 8 - prior art

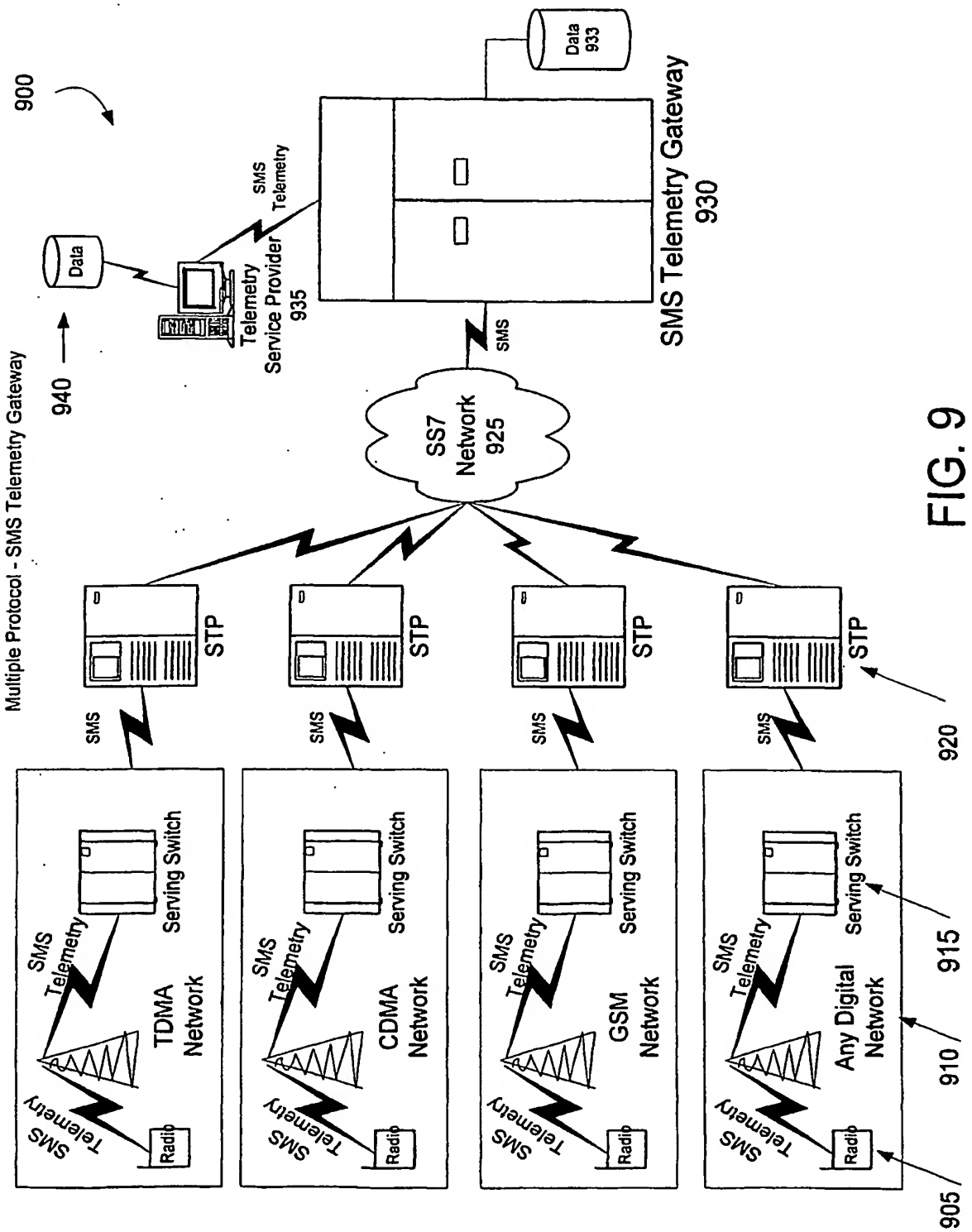

900
Multiple Protocol - SMS Telemetry Gateway
940
Data
Telemetry Service Provider 935
SMS Telemetry
Data 933
SMS Telemetry Gateway 930
SMS
SS7 Network 925
STP
STP
STP
STP
SMS
SMS
SMS
SMS
SMS Telemetry
Serving Switch
TDMA Network
CDMA Network
GSM Network
Any Digital Network
Radio
920
915
910
905

FIG. 9

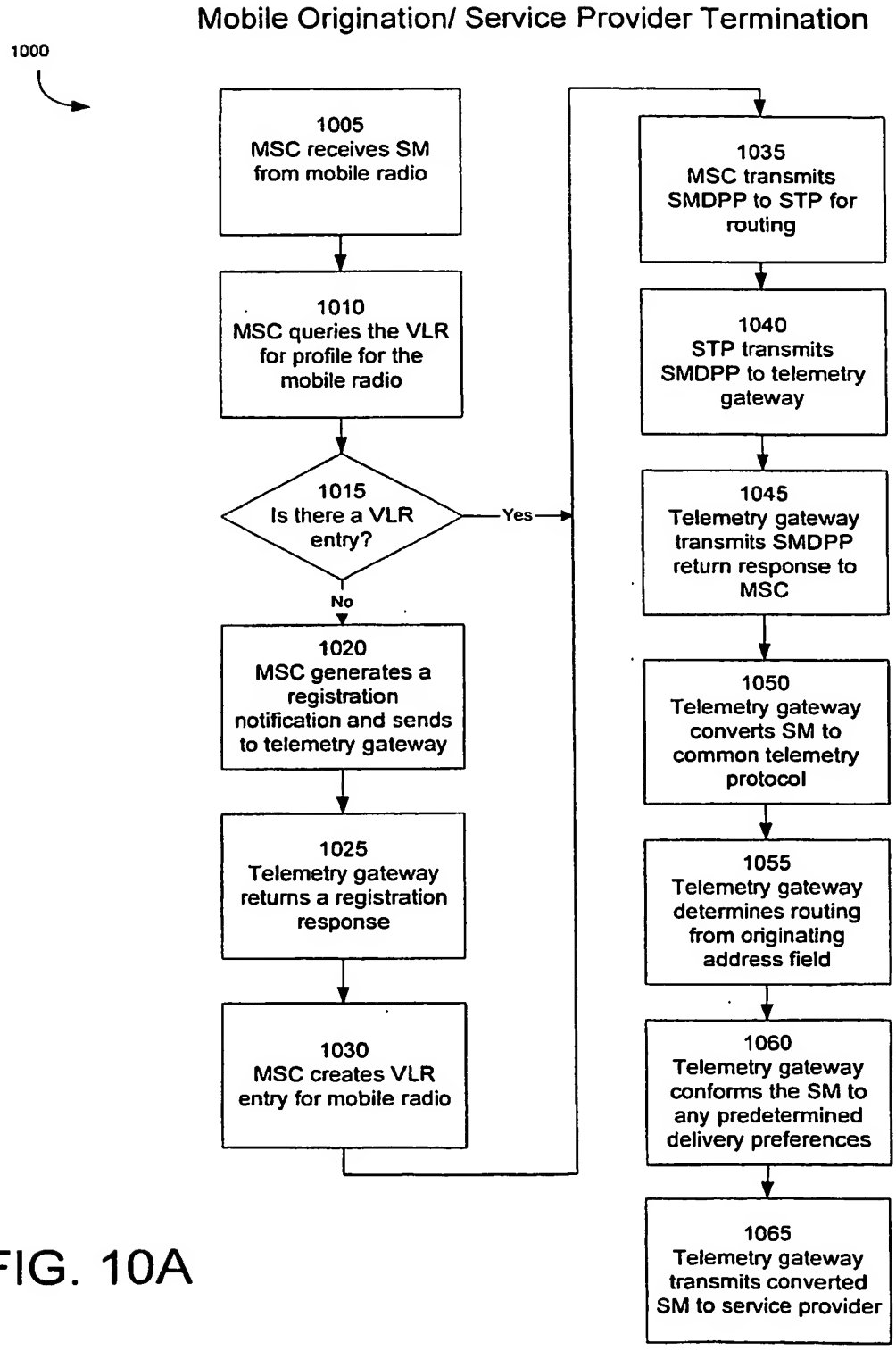

Mobile Origination/ Service Provider Termination
1000
1005
MSC receives SM from mobile radio
1010
MSC queries the VLR for profile for the mobile radio
1015
Is there a VLR entry?
Yes
No
1020
MSC generates a registration notification and sends to telemetry gateway
1025
Telemetry gateway returns a registration response
1030
MSC creates VLR entry for mobile radio
1035
MSC transmits SMDPP to STP for routing
1040
STP transmits SMDPP to telemetry gateway
1045
Telemetry gateway transmits SMDPP return response to MSC
1050
Telemetry gateway converts SM to common telemetry protocol
1055
Telemetry gateway determines routing from originating address field
1060
Telemetry gateway conforms the SM to any predetermined delivery preferences
1065
Telemetry gateway transmits converted SM to service provider

FIG. 10A

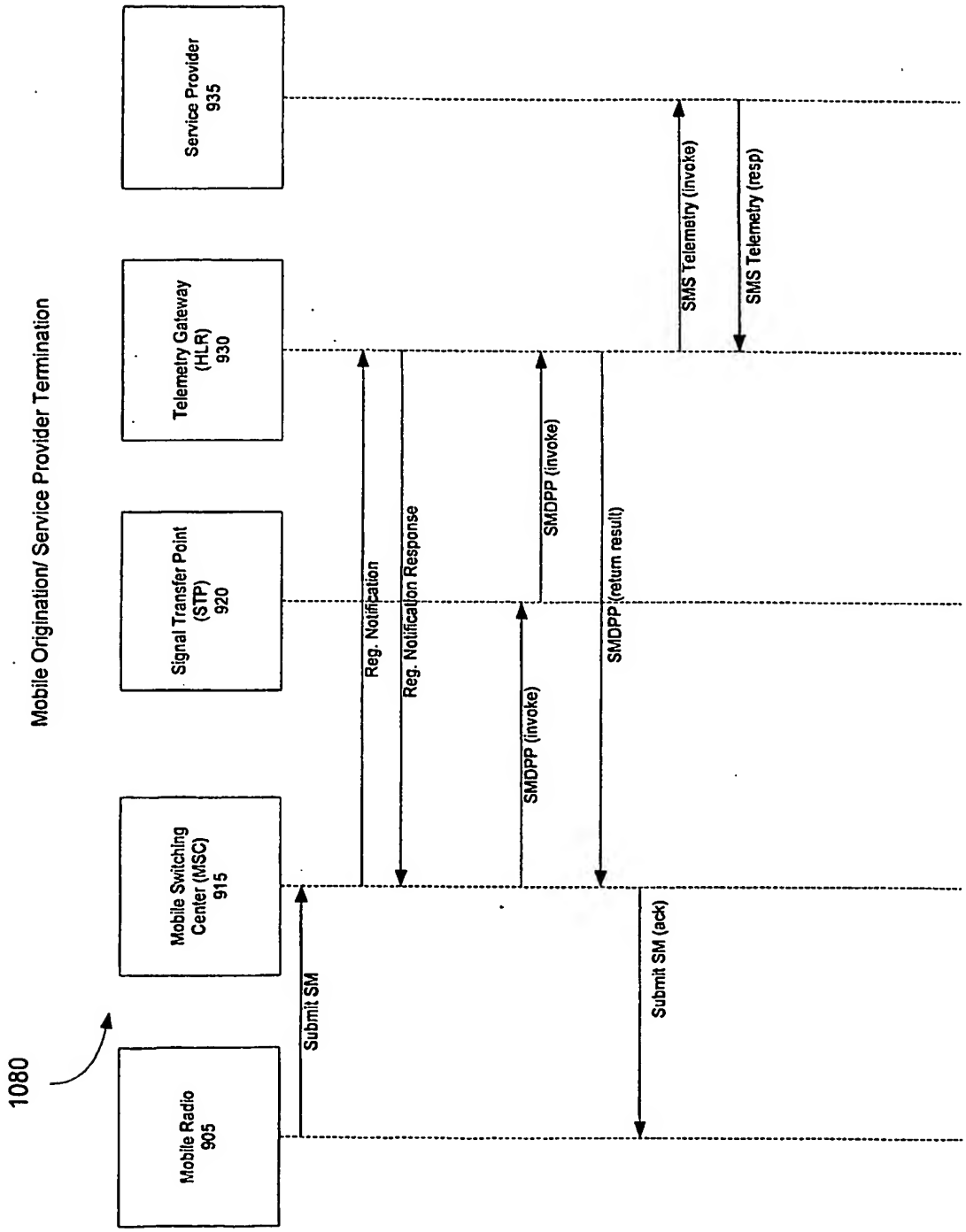

Mobile Origination/ Service Provider Termination
1080
Mobile Radio 905
Mobile Switching Center (MSC) 915
Signal Transfer Point (STP) 920
Telemetry Gateway (HLR) 930
Service Provider 935
Submit SM
Reg. Notification
Reg. Notification Response
SMDPP (invoke)
SMDPP (invoke)
SMDPP (return result)
SMS Telemetry (invoke)
SMS Telemetry (resp)
Submit SM (ack)

FIG. 10B

Service Provider Origination/ Mobile Termination

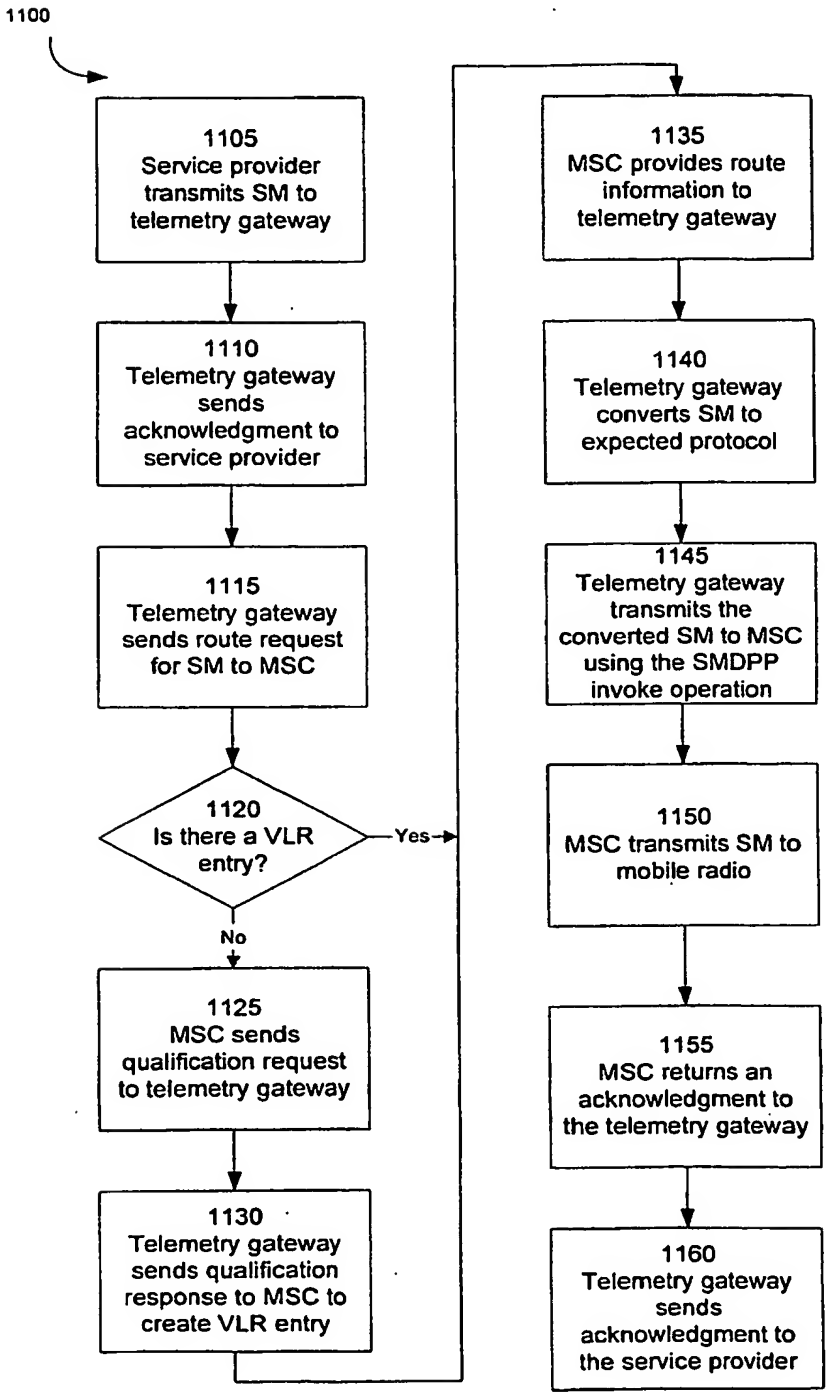


Fig. 11A

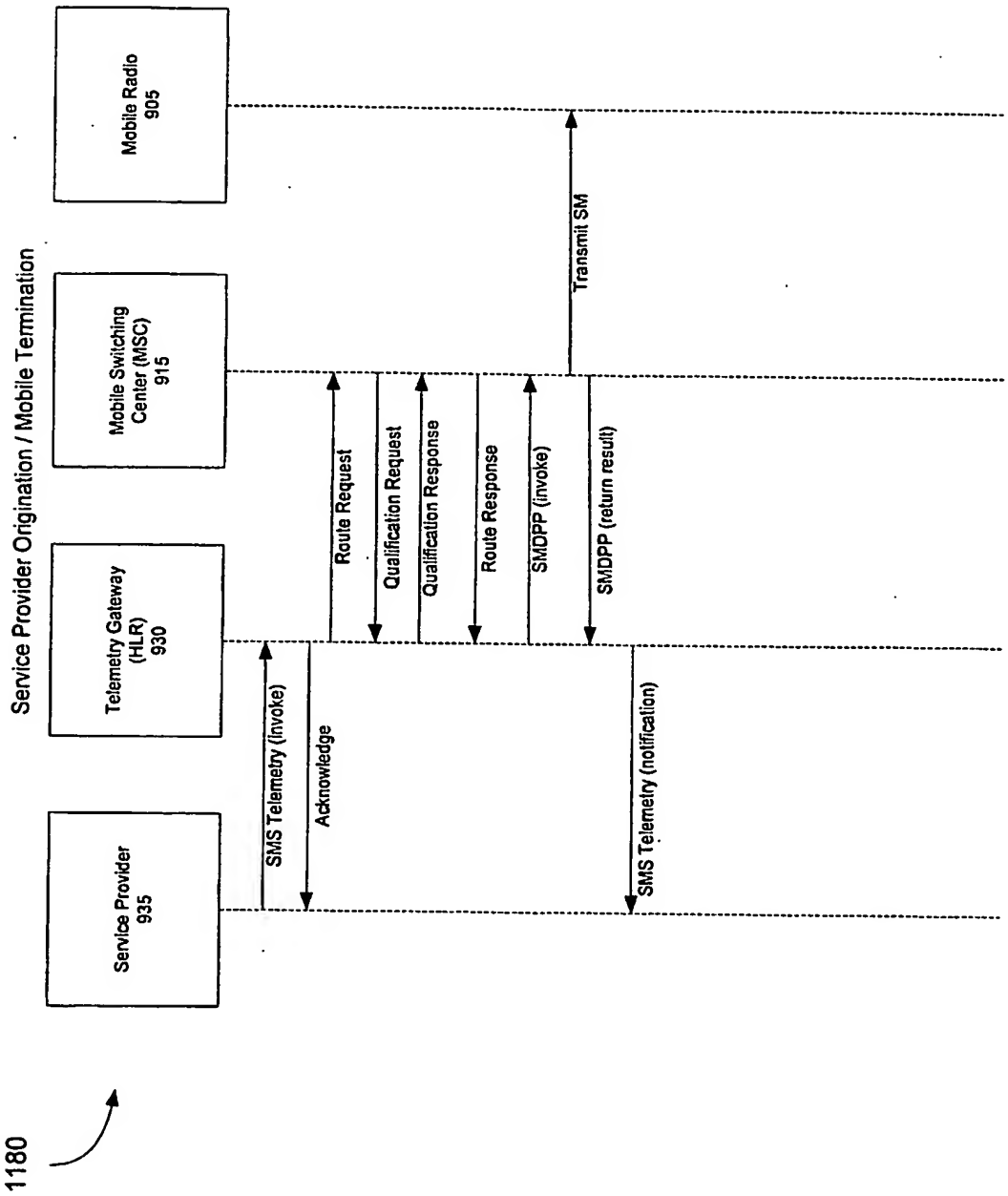

1180
Service Provider Origination / Mobile Termination
Service Provider 935
Telemetry Gateway (HLR) 930
Mobile Switching Center (MSC) 915
Mobile Radio 905
SMS Telemetry (invoke)
Acknowledge
Route Request
Qualification Request
Qualification Response
Route Response
SMDPP (invoke)
SMDPP (return result)
Transmit SM
SMS Telemetry (notification)

FIG. 11B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/23794

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : H04Q 7/20
US CL : 455/466
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 455/466, 435.1, 433, 432.3, 432.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,933,784 A (GALLAGHER et al.) 03 August 1999, fig. 2, 5, 8.	1-38
Y	US 6,259,781 B1 (CROUCH et al.) 10 July 2001, fig.2; col. 2 and its description.	1-38
Y	US 6,151,507 A (LAIHO et al.) 21 November 2000, abstract; figs. 2,3.	4,5,10,11,15,21,27,34,38
Y	US 6,067,454 A (FOTI) 23 May 2000, abstract; fig. 1.	8,17,23,29

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
27 October 2005 (27.10.2005)

Date of mailing of the international search report
09 NOV 2005

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Form PCT/ISA/210 (second sheet) (April 2005)